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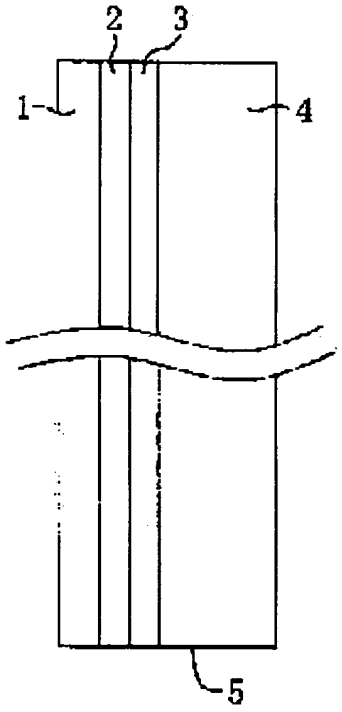
(54) FLEXIBLE SUBSTRATE FOR PRINTED WIRING, AND MANUFACTURING METHOD THEREFOR

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a flexible substrate for printed wiring that does not require special surface treatment of polyimide film, reduces costs while saving complex labor, controls copper plating to desired thickness, and has high heat resistance and adhesive properties, and to provide its manufacturing method.
SOLUTION: A heat-resistance resin composition covering for electroless plating for eliminating the need for the corrosion of one surface or both the surfaces of a polyimide films is formed, electroless copper plating is made by each process of covering activation, catalysis imparting, and catalysis activation, and then copper plating covering is formed to desired thickness through electroless plating.



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CLAIMS

[Claim(s)]

[Claim 1] The manufacture approach of the flexible substrate for printed circuits characterized by to carry out copper plating to desired thickness with electrolysis plating the process which forms the resin constituent coat for heat-resistant nonelectrolytic plating which does not need a corrosion process for one side or both sides of a polyimide film, this coat activation process, a catalyst grant process, and catalytic-activity chemically-modified degree, and after performing non-electrolytic-copper plating by the nonelectrolytic-plating approach which consists of 5 of a non-electrolyzed metal plating process processes.

[Claim 2] The manufacture approach of the flexible substrate for printed circuits according to claim 1 which is the resin constituent with which the resin constituent for heat-resistant

nonelectrolytic plating which does not need a corrosion process combined the chemical structure which has at least one sort of the nitrogen and hydrogen bond chosen from the group of following (A), and a salt formation nature functional group, and is characterized by form the coat of this resin constituent in both sides of a film.
(A) The amino group, imino association, amide association, a urethane bond, an urea bond, a secondary amine, and melamine structure [claim 3] the manufacture approach of the flexible substrate for printed circuits according to claim 1 characterize by use the weak acidic water solution with which the resin constituent for heat-resistant nonelectrolytic plating which do not need a corrosion process be any one combination containing a salt formation nature functional group of following (1), (2), and the (3), and the coat of this resin constituent be make to form in one side of a film, and Pd exist as a cation in a catalyst grant process.
(1) Between the low molecular weight compound which has basification study structure, and a carbon atom, consist of polybasic acid which has the adhesive polymer and double bond which have a double bond, and put together.
(2) Consist of an adhesive polymer with a high basification study structure consistency, this polymer, and polybasic acid that has a double bond with compatibility, and put together.
(3) As basification study structure, between the resinous principle which generates hydrogen and nitrogen association, and a carbon atom, consist of either of polybasic acid or the both sides which has the adhesive polymer or double bond which has a double bond, and put together at a hardening reaction.
[Claim 4] The manufacture approach of the flexible substrate for printed circuits according to claim 3 characterized by for the basification study structure of the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process being either secondary-amine structure or melamine structure, and the component which has a salt formation nature functional group being trimellitic acid or its derivative.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the flexible substrate for the printed circuits which are spreading through the electronic industry field, and its manufacture approach.

[0002]

[Description of the Prior Art] The flexible substrate of a polyamide film is used for a TAB tape or the printed-circuit versions. A coefficient of thermal expansion is small, there are few problems in junction for a chip and the printed-circuit version, and it excels in a mechanical property or thermal resistance. In recent years, small and light-ization of electronic equipment advances rapidly, and the need of FPC and TAB is growing. Furthermore, high integration of a chip increases further and, as for a polyimide copper foil laminate, the demand to CSP and BGA is also increasing. About the flexible copper-clad laminate of a polyimide film, the technique of the manufacture approach by the sputtering method is conventionally well-known. For example, the technique of the manufacturing method of the metal thin film substrate by the sputtering method is indicated by JP,09-136378,A. The metal thin film substrate by this sputtering method was manufactured by the polyimide film by things by the approach by copper sputtering making copper form on a polyimide film. Or it was manufactured by etching the front face of polyimide into JP,7-243049,A with the water solution containing a hydrazine and an alkali-metal hydroxide, and making a copper plating coat form by the nonelectrolytic plating method. The aforementioned sputtering method needed the big chamber, the activity was complicated and the yield had become [the formation rate] slow cost quantity from the bad thing. Moreover, about the etching processing by an above-mentioned hydrazine and an above-mentioned alkali-metal hydroxide, since toxicity was in a hydrazine, there was a problem of using a remarkable nerve for safety and workability.

[0003]

[Problem(s) to be Solved by the Invention] the flexible substrate for printed circuits which raises the productivity which this invention was made as a result of inquiring in view of the situation like the above, and was excellent, and its manufacture approach -- offer -- it aims at things.

[0004]

[Means for Solving the Problem] That is, this invention is the approach of manufacturing the flexible substrate for printed circuits, by carrying out copper plating to desired thickness with electrolytic-copper plating, the process which forms the coat of the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process for one side or both

sides of a polyimide film, the process which activates this coat, a catalyst grant process, and catalytic-activity chemically-modified degree, and after performing non-electrolytic-copper plating by the nonelectrolytic-plating approach which consists of 5 of a non-electrolyzed metal plating process processes.

[0005] This invention is the resin constituent with which the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process in said process combined at least one sort of chemical structures chosen from the group of following (A) which has nitrogen and hydrogen bond, and a salt formation nature functional group, and is the approach of manufacturing the flexible substrate for double-sided printed circuits which forms the coat of the resin constituent in both sides of a film.

(A) The amino group, imino association, amide association, a urethane bond, an urea bond, a secondary amine, and melamine structure.

[0006] this invention be the approach of manufacture the flexible substrate for one side printed circuits which use the weak acidic water solution with which the resin constituent for heat-resistant nonelectrolytic plating which do not need a corrosion process consist of any one combination containing a salt formation nature functional group of following (1), (2), and the (3) again, and the coat of the resin constituent be make to form in one side of a film, and Pd exist as a cation in a catalyst grant process.

[0007] (1) Between the low molecular weight compound which has basification study structure, and a carbon atom, consist of polybasic acid which has the adhesive polymer and double bond which have a double bond, and put together.

[0008] (2) Consist of an adhesive property polymer with a high basification study structure consistency, its polymer, and polybasic acid that has a double bond with compatibility, and put together.

[0009] (3) As basification study structure, between the resinous principle which generates hydrogen and nitrogen association, and a carbon atom, consist of either of polybasic acid or the both sides which has the adhesive polymer or double bond which has a double bond, and put together at a hardening reaction.

[0010] This invention is the approach of the basification study structure of the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process in the manufacture approach of said substrate for one side printed circuits being either secondary-amine structure or melamine structure, and manufacturing further the flexible substrate for one side printed circuits whose component which has a salt formation nature functional group is trimellitic acid or its derivative.

[0011] After depositing copper in what applied the above-mentioned resin constituent for nonelectrolytic plating to the polyimide film with non-electrolytic copper plating and giving conductivity to it in this invention, It is the manufacture approach of the flexible substrate for

printed circuits which forms a copper-plating coat in desired thickness with electrolytic copper plating, and is characterized by becoming The means for solving a technical problem of an one side plate or a double-sided plate by making a resin constituent into one side or both sides of a polyimide film with **.

[0012]

[The mode of implementation of invention] As an example of the flexible substrate for printed circuits which drawing 1 requires for this invention, the flexible single-sided board 5 and drawing 2 are each sectional view showing the lamination of the flexible double-sided substrate 6 as other same examples. In drawing 1 and drawing 2 , the coat 1 of electrolytic copper plating is formed on the coat of the resin constituent with which 4 was applied to the heat-resistant insulation base material, and 3 was applied on the base material 4, and the non-electrolytic copper plating coat 2 formed on it. following this invention -- further -- a detail -- a process exception -- and both double-sided substrate and single-sided board are explained.

[0013] With the resin constituent of the resin constituent coat for nonelectrolytic plating which does not need the corrosion process formed on a galvanized field in the first process, the group of (A), Namely, although it is the resin constituent which combined the amino group, imino association, amide association, a urethane bond, an urea bond, a secondary amine and melamine structure, the chemical structure that has at least one sort of the nitrogen and hydrogen bond chosen more, and a salt formation nature functional group The coat of this constituent needs the combination of following (1), (2), and (3) which could not apply but was limited further for all the single-sided boards. That is, between the low molecular weight compound which has (1) basification study structure, and a carbon atom, consist of polybasic acid which has the adhesive polymer and double bond which have a double bond, and put together.

[0014] (2) Consist of an adhesive property polymer with a high basification study structure consistency, its polymer, and polybasic acid with compatibility, and put together.

[0015] (3) As basification study structure, consist of either of polybasic acid or the both sides which has the adhesive polymer or double bond which has the resinous principle which generates hydrogen and nitrogen association, and a double bond at the time of hardening, and combine with it.

[0016] The catalyst for which the reason which limits the contents of a resin constituent further in the case of a single-sided board is used in the nonelectrolytic plating by the conventional corroding method is the catalyst considered so that it might be easy to adhere on a plastics side, and even if it forms the resin constituent coat used for this invention only at one side, a catalyst adheres also to a rear face, and although a plating coat deposits and exfoliates also at the rear face during non- electrolyzed metal plating or adhesion is scarce, it adheres. Although this difference originates in a base material, since removal from a plating product is needed

and all serve as waste of plating liquid, in the case of removal prompt from the plating liquid of an exfoliation coat in the case of the former, and the latter, it is industrially unsuitable.
[0017] In a single-sided board, it does not adhere to a plastics side, therefore with the nonelectrolytic plating of usual plastics, even if it uses the catalyst which is not used, the function in which a catalyst adheres is required, and the resin constituent coat for said single-sided boards achieves this function.
[0018] In addition, as for thermal resistance, it is desirable that the pyrolysis temperature of each component which 260 degrees C and the thermal resistance for 10 seconds are usually required with the thermal resistance which is equal to a solder heat resistance test, therefore forms a resin constituent is 260 degrees C or more. As a desirable combination from which such a heat-resistant-resin coat is obtained easily, there is trimellitic acid or its derivative in the basic component which has nitrogen and hydrogen bond as the thing which has the secondary-amine structure formed in the epoxy resin which uses melamine structure and an amine as a curing agent, and a thing which has a salt formation nature functional group, and the resin constituent coat for non-electrolyzed partial plating with a solder thermal resistance of 260 degrees C is obtained with such combination.
[0019] In order to obtain these resin constituent coats in the first process of this invention, the component which has the chemical structure which combined these or can form the chemical structure at the time of hardening is dissolved in a solvent, the paint is prepared, and it is obtained spreading, stoving, or by making it harden. Although a spray coating cloth, a dip painting cloth, spreading by DAIKO-TA -, etc. can be used in order to apply the paint to a film plane, the approach by DAIKO-TA - is excellent in the point of the homogeneity of spreading thickness, and the ease of thickness control. Desirable thickness is 1-20 micrometers.
[0020] Although spreading afterbaking desiccation is performed, since the temperature and time amount are accompanied by the heat-curing reaction, the plating coat may change with contents of the constituent, and may not need full hardening, and pass each process after this process searches for the conditions which demonstrate the target engine performance by experiment. Generally they are 80-160 degrees C and the range for 30 minutes.
[0021] The acid component which is the salt formation nature functional group contained in the resin constituent coat formed at the first process of the second process (coat activation process) exists as a free acid or an acid anhydride, and cannot give a catalyst in the catalyst grant process of degree process in the condition of this as. This process is a process which makes the free acid or acid anhydride in a coat an alkali-metal salt, and that approach is immersed at the temperature around 50 degrees C into the weak alkaline liquid containing neutral detergent, and performs this formation coat.
[0022] Although the third process (catalyst grant process) is a process made to adhere to the coat which activated Pd catalyst, in the case of a single-sided board, the solution (for example,

weak hydrochloric-acid acidic solution of PdCl2) containing Pd cation is used. In the case of a double-sided substrate, the catalyst to which Pd currently used by the nonelectrolytic plating approach of performing the usual corrosion exists in a ** anion can also be used. In the case of this catalyst, reduction of degree process can be performed very easily and becomes advantageous in price.

[0023] Although the fourth process (catalytic activity chemically-modified degree) is a process which returns Pd ion on the coat by which catalyst grant was carried out to the effective metal Pd when nonelectrolytic plating performs metal plating, an approach changes with used catalysts. That is, in a double-sided substrate, when Pd usually used uses the catalyst which exists as a ** anion, since the stannous chloride of a reducing agent is also contained for this catalyst, it is returned to Metal Pd only by being immersed into a hydrochloric acid for a short time.

[0024] In the case of a single-sided board, since the catalytic liquid which surely contains Pd cation for partial plating is used, it carries out using a reducing agent. Although both various kinds of reducing agents currently generally used as a reducing agent, for example, dimethylamino borane, specific hypophosphite a hydrazine a hydrazine compound sodium borohydride, etc. can be used, especially a desirable thing is dimethylamino borane.

[0025] The fifth process (non-electrolyzed metal plating process) is a process which contacts the coat to which Pd metalized at the last process has adhered in non-electrolytic copper plating liquid, and deposits a copper-plating coat on the coat. At this process, the non-electrolytic copper plating liquid used for non-electrolytic copper plating on condition that usual can be used, and non-electrolytic copper plating can be performed on condition that usual. However, a plating deposit rate changes with the presentations, metal plating liquid has the large crystal of the copper which deposited when a deposit rate was quick, and is deposit stress size, and the fall of the adhesion of a plating coat serves as size. It is desirable to use non-electrolytic copper plating liquid with a slow deposit rate.

[0026] The resin constituent coat for non-electrolyzed metal plating used as the nucleus of this invention which does not need a corrosion process in the first process is further explained to a detail.

[0027] This coat is within the limits of the application for patent of invention (JP,10-183358,A) for which one person, such as this invention person, applied, and both invention of the Heisei 10 application for patent 167028. Invention of the latter non-electrolyzed partial plating approach is the approach of using the resin constituent which limited structure further as an object for partial plating among the resin constituents of the former invention. Therefore, although the resin constituent of the former invention is applicable to manufacture of a double-sided substrate, it is an indispensable condition to use the resin constituent coat which cannot apply the resin constituent of the structure removed from the latter claim in the case of a

single-sided board, but is used in the latter invention. Hereafter, the contents of the resin constituent coat are described concretely.

[0028] Although the amino group, imino association, a urethane bond, an urea bond, secondary-amine structure, and melamine structure are mentioned as the chemical structure which has (A) nitrogen and hydrogen bond which is the indispensable chemical structure of the resin constituent coat used for this invention, the compound or polymer which has these chemical structures is illustrated below.

[0029] An amino-group content polymer and an imino joint content polymer have many polymers of lower alcohol fusibility, such as a water-soluble methanol, and these are lacking in an adhesive property with a polyimide film. The possibility of use increases by using together a heat-resistant adhesive property polymer with these and compatibility with low molecular weight compounds, such as an aminophenol, an aminobenzoic acid, and an imidazole system compound, rather. The basic low molecular weight compounds which are one of the basic components of the resin constituent currently mentioned to the manufacture approach of a single-sided board are the aforementioned compounds, and aromatic polyester system adhesives can be mentioned as an example of a heat-resistant adhesive property polymer which has the double bond used combining this.

[0030] Moreover, although the adhesive polymer with a basification study structure consistency high as other basic components is mentioned, melamine structure corresponds to this. Other nitrogen and hydrogen bond are obtained by the reaction of a nitrogen component and other functional-group content polymers. That is, the amino group, an epoxy resin, and melamine structure are acquired [a urethane bond / an isocyanate radical, polyol and an urea bond] for an isocyanate radical, polyamine, and secondary-amine structure by the reaction with a partial alkylation melamine (benzoguanamine with approximation structure shall also be included in a melamine), polyol, or an epoxy resin.

[0031] A salt formation nature functional group can call a metal atom the functional group which forms a salt, for example, a carboxyl group, a sulfonic acid group, a phenolic hydroxyl group, a phosphoric-acid radical, etc. can be mentioned. In this invention, a carboxyl group, a sulfonic acid group, and a phosphoric-acid radical are desirable practically. The compound which has a salt formation nature functional group is the polymer or low molecular weight compound which has the aforementioned functional group. Especially a desirable thing is the compound which has a carboxyl group as a salt formation nature functional group, and its copolymer or graft copolymer which makes a comonomer the polybasic acid and partial saturation polybasic acid which have two or more carboxyl groups in a monad in this case is desirable. As such an example, although maleic-acid denaturation polymers, such as mallein-ized polybutadiene, mallein-ized rosin, and a styrene maleic anhydride copolymer, can be illustrated, in the case of a single-sided board, it is limited to 1 and 4 mallein-ized

polybutadiene as what has a double bond in a principal chain.
[0032] Aromatic series system polybasic acid can be used for the resin constituent for single-sided boards as polybasic acid which a double bond is in a benzene nucleus and has a double bond. Phthalic anhydride, trimellitic anhydride, and these derivatives are mentioned as an example. Especially a desirable thing is trimellitic anhydride.
[0033] Since the aromatic polyester system polymer which has a carboxyl group and a hydroxyl group as an adhesive polymer in the both ends currently used as hot melt adhesive has a double bond and a carboxyl group, it is excellent as an adhesive amelioration polymer which does not check the deposit nature of a plating coat. There are aliphatic series polybasic acid and trimellitic acid, such as a malonic acid, a maleic acid, a succinic acid, and an itaconic acid, as low-molecular-weight polybasic acid which can be used for concomitant use with a polymer with such an adhesive property. In the case of a single-sided board, it is limited to a partial saturation acid with a double bond.
[0034] The nonelectrolytic plating approach can be used for these compounds in common with no combination illustrated by this invention, and they are restrained by the adhesive fall limit over the base material of the compatibility over the resin constituent which has the nitrogen and hydrogen bond combined in the nonelectrolytic plating approach, and the resin constituent by this combination etc. Moreover, besides the combination of the polymer or compound which has the chemical structure of (A), and the compound which has a salt formation nature functional group, the third components, such as an adhesive amelioration agent for improving the membrane formation nature to a curing agent and a base material and an adhesive property and a spreading workability amelioration agent, can be added within limits which do not have trouble in nonelectrolytic plating nature.
[0035] There are the polybutadiene system polyol of a coating, unsaturated fatty acid polyester, drying-oil denaturation polyester, aromatic polyester system adhesives, an epoxy resin, and novolaks that are used as a tackifier as the membrane formation nature to said base material, and an adhesive amelioration agent.
[0036] As stated above, the chemical structure of the resin constituent coat used for the non-electrolyzed metal plating approach which does not need a corrosion process is the combination of very general basic structure and an acidic group. Although many combination constituents of such the chemical structure are extremely considered since partial plating will be attained, there will be no need that moreover these chemical structures exist in single intramolecular and it will not interfere with mixture if the structure where a double bond is furthermore in a principal chain is put together The solvent solubility of each component, compatibility, the adhesive property over the base material of the obtained coat, Moreover, since the rate of a compounding ratio is related to the deposit nature of a plating coat, and the adhesive property between a resin coat and a plating coat, begin to pass examination of many,

such as compatibility to the application made into examination of the optimal compounding ratio, and the purpose of the obtained plating coat, and it is connected with utilization.
[0037] In this invention, a base material is polyimide resin with difficult adhesion with strong therefore opposite solvent nature, and it is the application as which the elevated-temperature thermal resistance of 260 degrees C is required. this invention person etc. completes the manufacture approach of a valuable flexible printed circuit board for the constituent which can be applied to this purpose on a header and a new industrial target, as a result of examining the constituent of said invention wholeheartedly.
[0038] Although the heat-resistant insulation base materials used in this invention are various polyimide films, they are a you PIREKKUSU film (Ube Industries, Ltd. make), an APIKARU film (Kaneka Co., Ltd. make), the Kapton film (Du Pont-Toray make), etc., for example, and its thickness is [25 micrometers and 50 micrometers] practical. Surface treatment was performed especially, for example, the adhesion effectiveness improves about the film by plasma treatment, mat processing, etc.
[0039]
[Example] Although the example which forms the resin constituent coat for nonelectrolytic plating which does not need the corrosion process of this invention on a polyimide film side, and forms the coat which differs in the presentation of a resin constituent in the approach of performing non-electrolytic copper plating and manufacturing a printed circuit board is shown, the operating procedure and the evaluation approach in these examples are as follows.
[0040] They are a spray method or DAIKO-TA about the paint which cut each formation approach various polyimide film of the resin constituent coat to an operating procedure 1. operating procedure (1) film top in 15cmx15cm size, and prepared it in the example of an all directions method on one side of the cutting sample. - After applying by law, stoving of each test piece is carried out according to each conditions, and it is stiffened.
(2) The conditions of each process of the second process - the fifth process perform nonelectrolytic plating to the test piece by which the nonelectrolytic plating approach aforementioned heat-treatment was carried out using the drug solution used in each process.
[0041] 1. Use Drug Solution : it is All made in Okuno Drug Industry [0042] except Hydrochloric Acid.
[Table 1]

第二工程（被膜活性化剤）	エースクリーンＡ２２０
第三工程（Ｐｄ触媒）	ＴＭＰアクチベーターまたはキャタリストＣ
第四工程（還元剤）	ジメチルアミノボラン または塩酸（キャタリストＣ使用の場合）
第五工程(無電解銅めっき剤)	ＯＰＣ－７５０

[0043] 2. Operation Conditions of Each Process [0044]
[Table 2]

第二工程	５５℃、５分
第三工程	２０℃、５分
第四工程	２０℃、１０分 キャタリストＣを使用、塩酸還元の場合３０℃、３分
第五工程	２０℃、２０分

[0045] 3. Electrolysis Plating Condition Copper-Sulfate Plating (Top RUCHINA 81SW: Product made from Okuno Pharmaceuticals)
25 degrees C, 3Amp, 90 minutes / dm2 [0046] 4. appraisal method JIS of an electrolysis plating coat C 5012 (8.6.1 tape length stripping strength) -- and -- JISC 5012 (the existence of abnormalities is checked with a 10.5.1 solder float glass process).
[0047]
[The example of operation] The class and compounding ratio of the paint are shown in Table 3, and about the evaluation result of the coat after electrolytic copper plating, after carrying out a solder heat test, the result to which tape ****** carried out ** is collectively shown in Table 3.
[0048]
[Table 3]

実施例 No.	樹脂組成				配合比				半田耐熱 260°×10秒	テープ引き剥がし
	(A)	(B)	(C) 接着性付与剤及び／又は硬化剤	(D) 硬化促進剤	A	B	C	D PHR		
1	0-アミノ安息香酸	トリメリット酸	ビスフェノール・テルペン共重合樹脂	−	10	50	40	−	○	○
2	2フェニルイミダゾール	1,4-マレイン化ポリブタジエン	*バイロン	−	5	35	60	−	○	○
3	ブチル化メラミン	トリメリット酸	−	p−トルエンスルホン酸	10	90	−	5	○	○
4	ブチル化メラミン	トリメリット酸	エポキシ樹脂	p−トルエンスルホン酸	8	72	20	5	○	○
5	ベンゾグアナミン樹脂	トリメリット酸	−	p−トルエンスルホン酸	10	90	−	5	○	○
6	ブチル化メラミン・ベンゾグアナミン縮合樹脂	トリメリット酸	エポキシ樹脂	p−トルエンスルホン酸	8	72	20	5	○	○
7	ベンゾグアナミン樹脂	トリメリット酸	バイロン	p−トルエンスルホン酸	10	80	10	5	○	○
8	アミノ基含有ポリマー	トリメリット酸	エポキシ樹脂	−	35	50	15	−	○	○
9	ブチル化メラミン+ジアミノジフェニルエーテル (注1)	トリメリット酸	エポキシ樹脂	p−トルエンスルホン酸	8	72	20	5	○	○

＊　バイロン３００　：　両末端にカルボキシル基と水酸基を有するホットメルト型芳香族熱可塑性接着剤で二重結合及びカルボキシル基を有するので、メッキ皮膜の折出性を阻害しない接着性改良成分として使用。

注１　混合比　１：１

[0049]

[Example 1] As a resin constituent for heat-resistant nonelectrolytic plating (it is indicated as a "resin constituent" below) which does not need a surface corrosion process o-aminobenzoic acid, trimellitic acid, and bisphenol-terpene copolymerization resin Blend by the ratio of 10-50-

40 (see Table 1), prepare the paint of 5% of solid content using ketones, and the spray coating cloth of this is carried out to a polyimide film ("YUPI REXX 50SPA"). After making it heat and harden at 80 degrees C for 30 minutes, nonelectrolytic plating and electrolysis plating were performed according to the aforementioned monograph affair.

[0050]

[Example 2] ** is avoided in the following examples, a resin presentation and its compounding ratio are omitted, and the column concerned of Table 1 is considered as reference. It carried out like the example 1 except having made solid content 10% with the resin presentation shown in Table 1, and its compounding ratio.

[0051]

[Example 3] After having prepared the paint of 10% of solid content using ketones, having used "YUPI REXX 50SM" as a polyimide film using the resin constituent (it is below the same except for combination and an example 8 in this example in p-toluenesulfonic acid as a hardening accelerator (D)) of a display, applying by DAIKO-TA - and making it heat and harden at 140 degrees C for 30 minutes, nonelectrolytic plating and electrolysis plating were performed according to the aforementioned monograph affair.

[0052]

[Example 4] It carried out like the example 3 using the resin constituent of a display except having made solid content 20%.

[0053]

[Example 5] Nonelectrolytic plating and electrolysis plating were performed by the same approach as an example 3 using the resin constituent of a display except having used "YUPI REXX 50SPA" as a polyimide film.

[0054]

[Example 6] It carried out like the example 5 using the resin constituent of a display except having made solid content 20%.

[0055]

[Example 7] Nonelectrolytic plating and electrolysis plating were performed by the same approach as an example 3 using the resin constituent of a display except having used "APIKARU 50NPP" as a polyimide film.

[0056]

[Example 8] It carried out like the example 3 using the resin constituent of a display except having made solid content 20%.

[0057]

[Example 9] It carried out like the example 3 using the resin constituent of a display except having used "Kapton V" as a polyimide film.

[0058]

[Effect of the Invention] As explained above, the resin constituent for nonelectrolytic plating used for this invention is the high thermal resistance and the resin constituent of high adhesion which were chosen so that it could apply to the flexible substrate for the printed circuits made from polyimide. Therefore, the polyimide nature flexible substrate made into the purpose can be easily manufactured by making this resin constituent coat form on a film plane, and the above-mentioned nonelectrolytic plating process's performing non-electrolytic copper plating, and considering as the thickness of a desired plating coat with electrolysis plating further. In addition, since control of the copper thickness of a flexible substrate is easy for this approach, the flexible copper foil laminate which suited various kinds of applications can be manufactured. And it is the clean manufacture approach which does not need a corrosion process.

[0059] That is, since the flexible substrate which can respond at this can manufacture easily the manufacture approach of the flexible printed circuit board of this invention by the low price and it is moreover a clean approach, it is very significant to the inside to which the super-finization of a circuit is going industrially.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional view showing an example (single-sided board) of the flexible substrate concerning this invention.

[Drawing 2] The sectional view showing other examples (double-sided substrate) of the flexible substrate concerning this invention.

[Description of Notations]

1 Electrolytic Copper Plating

2 Non-Electrolytic Copper Plating
3 Resin Constituent
4 Heat-resistant Insulation Base Material
5 Flexible Single-sided Board
6 Flexible Double-sided Substrate

[Translation done.]

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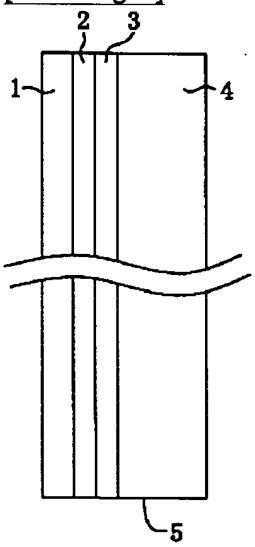
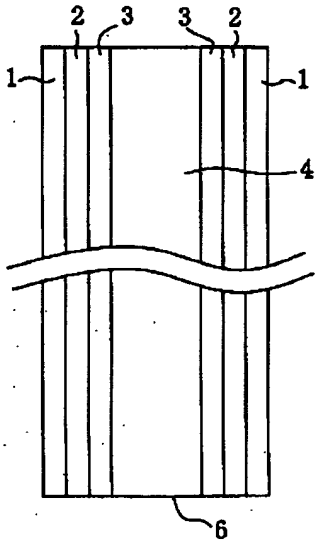
DRAWINGS

[Drawing 1]



[Drawing 2]



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WRITTEN AMENDMENT

[Procedure revision]
[Filing Date] October 2, Heisei 12 (2000. 10.2)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The manufacture approach of the flexible substrate for printed circuits characterized by to carry out copper plating to desired thickness with electrolysis plating the process which

forms the resin constituent coat for heat-resistant nonelectrolytic plating which does not need a corrosion process for one side or both sides of a polyimide film, this coat activation process, a catalyst grant process, and catalytic-activity chemically-modified degree, and after performing non-electrolytic-copper plating by the nonelectrolytic-plating approach which consists of 5 of a non-electrolyzed metal plating process processes.

[Claim 2] The manufacture approach of the flexible substrate for printed circuits according to claim 1 which is the resin constituent with which the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process combined the chemical structure which has at least one sort of the nitrogen and hydrogen bond chosen from the group of following (A), and a salt formation nature functional group, and is characterized by form the coat of this resin constituent in both sides of a film.

(A) The amino group, imino association, amide association, a urethane bond, an urea bond, a secondary amine, and melamine structure

[Claim 3] the manufacture approach of the flexible substrate for printed circuits according to claim 1 characterize by use the weak acidic water solution with which the resin constituent for heat-resistant nonelectrolytic plating which do not need a corrosion process be any one combination containing a salt formation nature functional group of following (1), (2), and the (3), and the coat of this resin constituent be make to form in one side of a film, and Pd exist as a cation in a catalyst grant process.

(1) Between the low molecular weight compound which has basification study structure, and a carbon atom, consist of polybasic acid which has the adhesive polymer and double bond which have a double bond, and put together.

(2) Consist of an adhesive polymer with a high basification study structure consistency, this polymer, and polybasic acid that has a double bond with compatibility, and put together.

(3) As basification study structure, at a hardening reaction, consist of an adhesive polymer which consists of a resinous principle which generates hydrogen and nitrogen association, and polybasic acid which has a double bond and which combines or has a double bond between these and a carbon atom, and put together.

[Claim 4] The manufacture approach of the flexible substrate for printed circuits according to claim 3 characterized by for the basification study structure of the resin constituent for heat-resistant nonelectrolytic plating which does not need a corrosion process being either secondary-amine structure or melamine structure, and the component which has a salt formation nature functional group being trimellitic acid or its derivative.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Modification

[Proposed Amendment]
[0009] (3) As basification study structure, at a hardening reaction, consist of an adhesive polymer which consists of a resinous principle which generates hydrogen and nitrogen association, and polybasic acid which has a double bond and which combines or has a double bond between these and a carbon atom, and put together.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0015
[Method of Amendment] Modification
[Proposed Amendment]
[0015] (3) As basification study structure, at a hardening reaction, consist of an adhesive polymer which consists of a resinous principle which generates hydrogen and nitrogen association, and polybasic acid which has a double bond and which combines or has a double bond between these and a carbon atom, and put together.

[Translation done.]